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AUTHOR Canipe, Stephen L.
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ABSTRACT

The problem of energy supply is a multifaceted problem. If a solution is to be found, there will probably be a multifaceted answer. The science classroom perhaps provides the best forum for the open exchange of ideas among potential solvers of the problem. The solution cannot be attacked from solely a technological or science base; the social and political aspects must also come into play, as the solution is bound to have a major foundation in the social sciences as well as the natural sciences. This synergy of results in the classroom should therefore be as up-to-date and as varied as possible, given the locale of the school. Hopefully, the utility company can help to make the teacher more aware of the points of synergy so that the learning process can maximize them. Several reasons why businesses (especially the electric utility industry) should be involved in the educational process are discussed, focusing on methods used by the Duke Power Company. These methods include teacher training, providing a part of the company's Educational Services Program, free loan film services to teachers, and the preparation and distribution of classroom materials. (Author/JN)

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INDUSTRY IN THE SCIENCE CLASSROOM: A UTILITY PERSPECTIVE

Stephen L. Canipe, Superv. of Ed. Services, Duke Power Co.

LADIES AND GENTLEMEN I AM HERE TODAY TO ADDRESS A MULTIFACETED PROBLEM, THAT OF ENERGY EDUCATION IN THE CLASSROOM AS AIDED BY THE ENERGY COMPANIES. THERE IS A PREMISE THAT SHOULD BE UNDERSTOOD WHILE TALKING ABOUT INDUSTRY IN THE SCIENCE CLASSROOM - THE TEACHER IS THE FINAL JUDGE OF THE MATERIALS VALIDITY. THE TEACHER IS THE ONLY PERSON WITH THE INTIMATE KNOWLEDGE OF THE CLASS TO DECIDE THE TIMELINESS OF THE MATERIAL.

THE PROBLEM OF ENERGY SUPPLY IS A MULTIFACETED PROBLEM. IF A SOLUTION IS TO BE FOUND, THERE WILL PROBABLY BE A MULTIFACETED ANSWER. THE SCIENCE CLASSROOM PERHAPS PROVIDES THE BEST FORUM FOR THE OPEN EXCHANGE OF IDEAS AMONG POTENTIAL SOLVERS OF THE PROBLEM. THE SOLUTION CANNOT BE ATTACKED FROM SOLELY A TECHNOLOGICAL OR SCIENCE BASE, THE SOCIAL AND POLITICAL ASPECTS MUST ALSO COME INTO PLAY AS THE SOLUTION IS BOUND TO HAVE A MAJOR FOUNDATION IN THE SOCIAL SCIENCES AS WELL AS THE NATURAL SCIENCES. THERE IS A SYNERGY OF RESULTS THEREFORE INTO THE CLASSROOM SHOULD BE AS UP TO DATE AND AS VARIED AS IS POSSIBLE GIVEN THE LOCALE OF THE SCHOOL. HOPEFULLY, THE UTILITY COMPANY CAN HELP TO MAKE THE TEACHER MORE AWARE OF THE POINTS OF SYNERGY SO THAT THE LEARNING PROCESS CAN MAXIMIZE THEM.

AS AN INDICATION THAT THERE NEEDS TO BE MORE ENERGY EDUCATION, I REFER TO THE NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS-ENERGY REPORT 08-E-01 BY THE EDUCATION COMMISSION OF THE STATES RELEASED IN DECEMBER, 1978. THE ASSESSMENT BEGAN BY CONSULTING PERSONS KNOWLEDGEABLE IN THE AREAS OF ENERGY WHO IDENTIFIED SOME OF THE GOALS AND OBJECTIVES OF ENERGY EDUCATION.

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AFTER QUESTIONS WERE DEVELOPED, THEY WERE REVIEWED BY SCIENTISTS, SCIENCE EDUCATORS, AND ENERGY EXPERTS AROUND THE COUNTRY. THE SURVEY CONTAINED 146 QUESTIONS ABOUT HALF AND HALF - ATTITUDES AND INFORMATION. SOME STARTLING AND REMARKABLE RESULTS OF THE SURVEY WERE:

- 1) LESS THAN HALF (49%) OF THE YOUNG ADULTS KNEW THAT COAL IS THE LARGEST FOSSIL FUEL RESERVE IN THE U. S.
- 2) ONLY 14% KNEW THAT COAL IS THE NATION'S PRIMARY ENERGY SOURCE USED TO PRODUCE ELECTRICAL ENERGY.
- 3) LESS THAN HALF (46%) KNEW THAT PETROLEUM PROVIDES THE LARGEST PERCENTAGE OF THE ENERGY CONSUMED IN THE U. S.
- 4) ONLY 15.7% KNEW THAT WE CURRENTLY GENERATE POWER WITH NUCLEAR FISSION.
- 5) ONLY 14% KNEW CORRECT ANSWERS TO A MAJORITY OF THE QUESTIONS DEALING WITH LICENSING AND START-UP TIMES FOR POWER PLANTS.

JOHN FOWLER OF NSTA NOTED FROM THE RESULTS THAT "WHILE SENSITIZED TO THE REALITIES OF THE ENERGY PROBLEM, YOUNG ADULTS SHOW LITTLE UNDERSTANDING OF THE TRADE-OFFS, TIME LAGS IN ENERGY PRODUCTION, CONVERSION PROCESSES AND THE TECHNOLOGIES ASSOCIATED WITH ENERGY DEVELOPMENT.."

THIS SURVEY OF THE YOUNG ADULTS IN THE COUNTRY GIVES ALL INTERESTED IN THE ENERGY PICTURE CAUSE TO PAUSE AND DIGEST EXACTLY WHAT IT IS TELLING US ABOUT THE DEGREE OF INFORMATION THAT IS HELD BY THE SEGMENT OF THE POPULACE...

ANOTHER REASON FOR OUR CONCERN IS THAT IN SO RAPIDLY CHANGING AN AREA AS ALTERNATIVE ENERGY SOURCES THE MATERIALS STUDENTS HAVE TO WORK WITH ARE ALMOST ALWAYS OUTDATED. GENERALLY, THE AVERAGE TEXTBOOK IS AT LEAST FIVE YEARS OLD. WHY? IT HAD TO BE WRITTEN. IT HAD TO BE

PRINTED, AT LEAST IN LIMITED QUANTITIES, AND THEN IT HAD TO BE REVIEWED BY VARIOUS STATE DEPARTMENTS OF EDUCATION. IT HAS TO BE ACCEPTED OR REJECTED. IF IT IS REJECTED, IT IS REJECTED FOR REASONS OR CAUSES. IF REJECTED, IT MAY BE REWRITTEN, OR CHANGED. THEN IT IS BOUND. THEN IT IS SENT TO RALEIGH OR COLUMBIA OR ALBANY, OR SOME OTHER DISTRIBUTION POINT WHERE IT IS WAREHOUSED UNTIL SUCH TIME AS IT CAN GET INTO THE MAINSTREAM OF THE EDUCATIONAL CYCLE. WHATEVER INFORMATION IT CONTAINS, AND THIS IS PARTICULARLY CRUCIAL INSOFAR AS STATISTICS ARE CONCERNED, IS AT LEAST FIVE YEARS OLD. TEXTBOOK CONTENT MAY BE SEVEN TO NINE YEARS OLD -- OR OLDER -- AND STILL BE IN THE SCHOOL SYSTEM.

A PERFECT EXAMPLE IS IN DADE COUNTY, FLORIDA, SCHOOLS, WHERE SCIENCE TEXTS BEING USED THIS FALL WERE COPYRIGHTED IN 1966 ... AND PROBABLY WRITTEN IN 1963 OR 1964. OPEC EMBARGOES, SHORTAGES OF NATURAL GAS AND OIL, AND THE CONTROVERSY OVER URANIUM-POWERED GENERATING PLANTS WOULD NOT EVEN HAVE BEEN THOUGHT OF AS GOOD FAIRY TALES 15 YEARS AGO. ENERGY TECHNOLOGY CONSTANTLY CHANGES AS YOU SO WELL KNOW, AND EXPERTISE IN THIS IMPORTANT AREA CAN ONLY COME FROM PEOPLE WHO WORK DAILY WITH THE REAL AND PRESENT ISSUES.

ADDITIONALLY, OUR TEACHERS TODAY HAVE BEEN BURDENED WITH THE SOCIAL RESPONSIBILITIES OF OUR SOCIETY. OVER THE YEARS WE DECIDED THAT TEACHERS SHOULDN'T CONCENTRATE ON JUST BASIC ARITHMETIC, READING AND WRITING, AND WE SADDLED THEM WITH CONCEPTS OF PROGRESSIVE EDUCATION. WE'VE ASKED THE TEACHERS TO TAKE ON DRUG EDUCATION AND SEX EDUCATION IN ADDITION TO HANDLING INCREASING DISCIPLINARY PROBLEMS. WE HAVE OVERWHELMED THE EDUCATORS. HOW MUCH TIME DO THEY HAVE LEFT TO PREPARE TOMORROW'S SESSIONS? I KNOW THE ARGUMENTS: I HAVE LISTENED TO THEM IN CHARLOTTE ... WHETHER A HIGH SCHOOL EDUCATOR SHOULD TEACH FIVE OR SIX PERIODS A DAY -- OR HAVE TWO RESTROOM PERIODS -- LUNCH PERIOD --

STUDY PERIOD -- BUS DUTY -- HOME ROOMS -- HALL DUTY.

SCHOOL TEACHERS ARE TRAINED IN METHODS OF TEACHING, AND MAY HAVE A GOOD GENERAL BACKGROUND IN MANY DIFFERENT SUBJECTS. THE EXPERTISE THAT COMES FROM WORKING IN THE "REAL WORLD" IS A VITAL ASSET TO THE EDUCATOR, HOWEVER, THAT SHOULD BE AVAILABLE BY CALLING ON LOCAL BUSINESSMEN AND WOMEN.

MOST TEACHERS -- AND I AM SPEAKING NOW PARTICULARLY OF GRADES K THROUGH 12, NOT COLLEGE -- GRADUATED FROM THE EDUCATIONAL DEPARTMENTS OF THEIR UNIVERSITIES. THESE EDUCATIONAL DEPARTMENTS HAVE CERTAIN BASIC REQUIREMENTS. THOSE REQUIREMENTS DO NOT ALWAYS, AND VERY SELDOM DO THEY EVER, INCLUDE BASIC COURSES IN BUSINESS ADMINISTRATION OR ECONOMICS, BECAUSE THEY ARE NOT REQUIRED, AND BECAUSE IN THE FOUR-YEAR CURRICULUM TIME PERIOD YOU SIMPLY CANNOT STUDY EVERYTHING.

I THINK ALSO, FROM MY PERSONAL OBSERVATION, THROUGH MEETING EDUCATORS AND ASSOCIATING WITH THEM AND BEING ONE, TEACHERS DON'T BELIEVE THEY ARE IN THE MAINSTREAM OF THE AMERICAN FREE ECONOMIC SYSTEM. THEY DON'T FEEL THEY ARE A PART. WE TALK ABOUT FREE ENTERPRISE, BUT TEACHERS DON'T SEE IT. THEY FAIL TO MAKE THE CONNECTION BETWEEN BUSINESS AND INDUSTRY MAKING PROFITS TO PAY THE TAXES WHICH RUN THE SCHOOLS AND PAY TEACHERS' SALARIES IN EVERY CITY AND TOWN IN THIS COUNTRY.

BECAUSE THE STATE SCHOOL SYSTEM IS A NON-PROFIT, GOVERNMENT-SPONSORED INSTITUTION, THE COMPETITIVE ECONOMIC REASONING OF BUSINESS PRESENTS A STRUCTURE WITHIN WHICH MOST TEACHERS HAVE NEVER HAD TO EXIST. OFTEN, ECONOMIC ISSUES -- AND THE HARD LAW OF SUPPLY AND DEMAND -- ARE VIEWED AND TAUGHT THROUGH MENTAL FILTERS OF IDEALISM, RATHER THAN AN UNDERSTANDING OF REALITY. THROUGH THOSE FILTERS, CORPORATE EFFICIENCY OFTEN BECOMES SUSPECT AMONG THE GREAT FORCES THAT SEEK TO DESTROY

OUR SOCIETY, NOT THOSE THAT BUILT IT.

AND SPEAKING OF MONEY, THAT'S ANOTHER REASON BUSINESS AND INDUSTRY SHOULD BE IN THE CLASSROOM ... THE LACK OF FUNDS AVAILABLE TO NEARLY EVERY COUNTY SCHOOL ADMINISTRATOR IN THE UNITED STATES. ALMOST DAILY, ONE CAN READ IN THE NEWSPAPER ABOUT THE SHORTAGE OF FUNDS IN THE LOCAL SCHOOL SYSTEM WHICH MAKES THE PURCHASE OF NEW TEXTBOOKS, A-V EQUIPMENT, LIBRARY BOOKS AND OTHER VALUABLE TEACHING AIDS IMPOSSIBLE.

TO SUMMARIZE, SOME OF THE MAJOR POINTS UNDER WHY A BUSINESS -- THE ELECTRIC UTILITY INDUSTRY, -- SHOULD BE IN THE EDUCATION BUSINESS:

A) YOUNG ADULTS IN THIS COUNTRY HAVE IN THE NATIONAL ASSESMENT DEMONSTRATED THEIR LACK OF ENERGY KNOWLEDGE AND THE MORE INPUTS THAT CAN BE BROUGHT TO BEAR ON THIS PROBLEM THE BETTER.

B) MUCH OF THE CLASSROOM MATERIAL USED BY TEACHERS TODAY, ESPECIALLY TEXTBOOKS, ARE OUTDATED AND IN SOME CASES CARRYING ERRONEOUS INFORMATION. DISSEMINATION OF TIMELY, EXPERT, APPROPRIATE ENERGY INFORMATION IS OUR RIGHT AND RESPONSIBILITY.

C) TEACHER EDUCATION PROGRAMS DO NOT ALWAYS PROVIDE BASICS ABOUT ECONOMICS AND THE AMERICAN FREE ENTERPRISE SYSTEM. IT IS THE RIGHT AND RESPONSIBILITY OF U. S. BUSINESS TO HELP FILL THAT VOID.

D) A SHORTAGE OF FUNDS IN THIS COUNTRY'S SCHOOL SYSTEM ARE DEPRIVING OUR YOUTH OF NEEDED EDUCATIONAL AIDS AND MATERIALS. IT IS THE RIGHT AND RESPONSIBILITY OF AMERICAN BUSINESS TO HELP FILL THAT VOID, WHERE APPROPRIATE.

WHAT THE EXACT FORM OF HELP IN THE CLASSROOM SHOULD TAKE IS A VERY HARD QUESTION TO ANSWER. FROM THE STANDPOINT OF DUKE POWER THAT HELP WILL TAKE ALMOST ANY TACT THAT THE TEACHER OR THE SCHOOL DESIRES. I CAN

OUTLINE THOSE METHODS THAT WE HAVE EMPLOYED IN THE PAST AND USE IN THE FUTURE.

OUR FIRST HELP IS IN THE AREA OF TEACHER TRAINING. EACH SUMMER FOR THE PAST FIVE YEARS WE HAVE HELD TEACHER WORKSHOPS WHERE THE TEACHER DONATES A WEEK OF TIME IN THE SUMMER AND ATTENDS OUR WORKSHOP CALLED ENERGY, ENVIRONMENT, AND ECONOMICS. SPEAKERS FROM ALL OVER THE COUNTRY ARE BROUGHT IN TO SPEAK TO THE TEACHERS. AMONG OUR PAST SPEAKERS WE HAVE HAD HOYT HOTTEL FROM MIT, CHRIS WHIPPLE FROM EPRI. WE ALSO BRING IN PEOPLE FROM THE RESEARCH TRIANGLE INSTITUTE, AND LOCAL COLLEGES AND UNIVERSITIES. COMPANY SPOKESPEOPLE COME TO TALK ABOUT THEIR JOBS WITH THE COMPANY...LIKE HEALTH PHYSICS, COAL CONTRACTS, ETC. OTHER TEACHER TRAINING TAKES PLACE IN LOCAL WORKSHOPS AND SEMINARS WHICH THE TEACHERS OR THE SCHOOLS REQUEST. WE HAVE MADE CONTACT WITH A NUMBER OF COLLEGES AND UNIVERSITIES THAT OFFER TEACHER TRAINING AND ARE BEGINNING TO WORK WITH THE COLLEGE STUDENTS PRIOR TO STUDENT TRAINING EXPERIENCES. PART OF OUR WORK INCLUDES FIELD TRIPS AND OTHER TOPICS NOT NORMALLY COVERED AS A PART OF THE TEACHER TRAINING CURRICULUM.

WE PROVIDE A FREE LOAN FILM SERVICE TO THE TEACHERS AND THIS HAS BEEN A BIG SUCCESS WITH ALL OF THE AVAILABLE FILMS GENERALLY BOOKED FOR THE SCHOOL YEAR BY NOVEMBER. IN ADDITION TO THE FILMS WE MAKE AVAILABLE TO THE TEACHERS PRINTED MATERIAL THAT OUTLINES VARIOUS TOPICS...FROM SAFETY AROUND ELECTRICAL APPLIANCES, TO FLOWER BROCHURES, TO QUESTIONS AND ANSWERS ON NUCLEAR ENERGY. MOST OF THESE WE MAKE AVAILABLE IN AT LEAST CLASS SETS AND IN SOME CASES IN STUDENT QUANTITIES.

MUCH OF OUR MATERIAL IS NOW BEING GEARED FOR READING AND MATH COMPETENCIES AND MORE OF IT WILL BE DONE IN THIS MANNER IN THE FUTURE. THE PEOPLE

IN OUR EDUCATIONAL SERVICES DEPARTMENT ARE CERTIFIED TEACHERS AND HAVE, THROUGH EXPERIENCE IN THE CLASSROOM, DEVELOPED CERTAIN WORKABLE STRATEGIES WHICH ARE SHARED WITH TEACHERS.

IN ADDITION TO PREPARED MATERIALS WHICH WE PROVIDE, WE HAVE BEGUN TO DEVELOP A LARGE NUMBER OF IN-HOUSE MATERIALS THAT SPECIFICALLY FIT THE NEEDS OF THE TEACHERS IN OUR AREA. CURRENTLY THERE HAVE BEEN DEVELOPED FIVE DIFFERENT EDUCATIONAL GAMES WITH MORE ON THE DRAWING BOARD. THERE IS A SET OF FIVE SOUND FILMSTRIPS THAT IS CURRENTLY UNDER PRODUCTION. A SET OF CAROLINA FACT SHEETS IS UNDERGOING REVISION - TO LIST BUT A FEW OF OUR PROJECTS.

IN ORDER THAT ALL OUR MATERIALS ARE OF USE IN THE CLASSROOM WE HAVE AN EDUCATIONAL ADVISORY COMMITTEE COMPOSED OF TEACHERS, ADMINISTRATORS, AND CURRICULUM PEOPLE FROM PUBLIC AND PRIVATE SCHOOLS TO EVALUATE THE MATERIALS WHICH WE MAKE AVAILABLE. THE MATERIALS THAT THIS GROUP THINKS ARE GOOD ARE OFFERED THROUGH OUR EDUCATIONAL SERVICES CATALOGUE.

THIS, THEN, IS OUR EDUCATIONAL SERVICES PROGRAM WHICH HELPS IN THE CLASSROOM. WE ARE CONSTANTLY ON THE LOOKOUT FOR NEW MATERIALS THAT WILL HELP THE TEACHER DO A BETTER JOB. WE ALSO NEED TO BE CONSTANTLY VIGILANT THAT WE DO NOT USE THE FREE MATERIALS TO PRESENT A FALSE PICTURE OF THE ENERGY SITUATION. WE BEGAN WITH A PREMISE THAT NEEDS TO BE REITERATED...THE TEACHER IS THE ONE WHO MUST BEAR THE DECISION TO USE OR NOT TO USE ANY MATERIALS. I WOULD HOPE THAT ALL THE MATERIAL EXPOSED TO THE SCIENCE STUDENT BE REVIEWED BY USE OF THAT TIME CHERISHED - SCIENTIFIED METHOD OFTEN NAMED BUT LESS SELDOM USED.

AS A CITIZEN, ALBEIT A CORPORATE ONE, IT IS OUR RESPONSIBILITY TO HELP ONE OF THE FOUNDATIONS OF OUR SOCIETY; IT WILL BE IN ALL OUR BEST INTERESTS FOR THERE TO BE A STRONG ENERGY ^{Program} ~~PROBLEM~~ IN THE SCHOOLS AND WE WILL TRY TO HELP IN ANY WAY THAT WE CAN TO INSURE IT.

1 TO UNDERSTAND THE PLACE OF ELECTRICITY IN THE ENERGY MIX OF THE FUTURE, IT IS FIRST OF ALL VERY IMPORTANT TO UNDERSTAND THE DIFFERENCES BETWEEN PRIMARY AND SECONDARY ENERGY SOURCES. ELECTRICITY IS A SECONDARY SOURCE MEANING THAT SOME PRIMARY SOURCE MUST BE EXPENDED TO GENERATE IT - THOSE PRIMARY SOURCES MOST OFTEN USED ARE COAL, OIL, NATURAL GAS, URANIUM, ETC. PROJECTIONS OF FUTURE ELECTRICAL USAGE MUST TAKE INTO ACCOUNT THOSE SOURCES WHICH CAN PROVIDE THE SAME SERVICES AS ELECTRICITY. IF NATURAL GAS, OIL, OR SOLAR BEGIN TO ACHIEVE A LARGER SHARE OF HOME HEATING, WATER HEATING, ETC. THERE WILL BE LESS ELECTRICAL GROWTH.

MANY IMponderables EXIST AS TO THE RELATIONSHIP OF SUPPLY, COST, AND DEMAND. TO SOME EXTENT AT LEAST DEMAND IS COST ELASTIC. THESE FACTORS AS WELL AS, AMONG OTHERS, CONSUMER DEMAND, LOAD MANAGEMENT, AND DISCRETIONARY INCOME CAUSE PROBLEMS IN PROJECTIONS OF THE FUTURE ELECTRICAL GROWTH.

2 WITH THESE PROBLEMS IN MIND, LETS EXAMINE ELECTRICAL GROWTH OVER THE NEAR TO MIDTERM FUTURE. IN 1977 OUR PROJECTIONS WERE MADE. AT THAT TIME THE STATE UTILITIES COMMISSION WAS PROJECTING SOMEWHAT HIGHER GROWTH RATES THAN WERE WE. MORE RECENTLY THE COMMISSION REVISED THEIR PROJECTIONS DOWNWARD SO THAT THEY CURRENTLY ARE WITHIN ABOUT 0.01% OF OURS. OUR PROJECTION THEN AND NOW IS THAT OVER THE NEXT 10 YEARS OR SO DEMAND WILL INCREASE AT A RATE ABOUT 5.4% PER YEAR. THIS IS DOWN FROM THE HISTORICAL GROWTH RATE CAUSING US TO BELIEVE THAT CONSERVATION, LOAD MANAGEMENT, AND OTHER ENERGY SAVING MEASURES DO WORK.

OVERALL ENERGY GROWTH IS INCREASING ABOUT 1.3%-1.4% A YEAR. ACCORDING TO OUR PROJECTIONS AND THOSE OF THE DEPARTMENT OF ENERGY, ELECTRICAL

ENERGY WILL PROVIDE AN INCREASINGLY LARGER SHARE OF THE TOTAL ENERGY MIX. PERHAPS AS MUCH AS 50% BY 2000. STATEWIDE THE GROWTH IN ELECTRICAL ENERGY SUPPLY HAS BEEN ACCOMPLISHED WITH COSTS INCREASING ONLY ABOUT AS FAST AS INFLATION. IN OTHER WORDS, ELECTRICAL ENERGY IS BEING SUPPLIED AT NO REAL COST INCREASE IN BASELINE DOLLARS.

- 3 THERE IS A PERSISTANT PROBLEM AMONG THE CONSUMING PUBLIC IN THE DIFFERENCE BETWEEN TOTAL ENERGY USAGE AND PEAK DEMAND. UNDER THE CURRENT NC REGULATIONS, ALL ELECTRICAL DEMANDS IN AN AREA MUST BE MET BY THE COMPANY HOLDING THE FRANCHISE FOR THAT AREA. TO HELP IN THE UNDERSTANDING OF THE DIFFERENCES BETWEEN TOTAL ENERGY USE AND PEAK DEMAND, VISUALIZE, IF YOU WILL, A SERIES OF FIVE MOUNTAIN PEAKS AND VALLEYS REPRESENTED BY YOUR HAND. IF ONE WISHES TO HAVE A 4-WHEEL JEEP TO GO UP AND DOWN - UP AND DOWN FOR THE ENTIRE DISTANCE WHICH MOUNTAIN PEAK WILL CAUSE THE VEHICLE THE MOST STRAIN? OBVIOUSLY THE STEEPEST AND TALLEST PEAK WOULD REQUIRE THE MOST EFFORT. IF THE JEEP WERE ABLE TO CLIMB THE HIGHEST PEAK THEN IT WOULD HAVE MORE THAN ENOUGH POWER TO TAKE CARE OF THE SMALLER PEAKS...BUT TO GO ALL THE WAY ACROSS, THEN POWER FOR THE HIGHEST MUST BE AVAILABLE. THIS OBVIOUSLY MEANS THAT AT TIMES YOU ARE PAYING FOR MORE JEEP POWER THAN YOU NEED. NOW VISUALIZE A CHILD'S HAND - MUCH SMALLER THAN YOUR OWN. IF YOU WERE TO GO UP AND DOWN THAT HAND, OR MOUNTAIN, STILL LESS POWER WOULD BE NEEDED.

- 4 LET'S BRING THIS BACK NOW TO ELECTRICITY - IF THE FINGERS REPRESENT WEEKLY DEMAND WITH THE ADULT HAND BEING WINTER AND THE CHILDS HAND BEING SPRING, THEN WHERE IS THE DEMAND FOR ELECTRICITY THE LEAST - SPRING OBVIOUSLY - SO - CAN POWER PLANTS BE BUILT FOR SPRING PEAKS - NO - SINCE THE SAME PLANTS MUST ALSO SERVE WHEN PEAKS ARE MUCH HIGHER - IN WINTER. WHAT OF ALL THIS POTENTIAL ELECTRICITY IN SPRING - IT IS SURPLUS. NOT ONLY DOES AN ELECTRIC COMPANY HAVE

TO WORRY ABOUT TOTAL ENERGY USED, BUT THOSE PEAKS ARE A GREAT CAUSE FOR CONCERN BECAUSE THEY MUST ALSO BE MET AS PER STATE LAW.

AS WITH THE JEEP - THE MOST EFFICIENT ENGINE (POWER PLANTS) ARE THOSE WHICH CAN OPERATE ALL THE TIME WITHOUT LONG PERIODS OF HALF USE - COSTS OCCUR ON THE JEEP WHETHER IT IS USED OR NOT - TAXES, INSURANCE, PAYMENTS, DEPRECIATION - THE SAME IS TRUE OF AN ELECTRIC GENERATING PLANT. WHETHER IT IS USED ONCE A WEEK OR DAILY, THE FIXED COSTS ARE THE SAME. OF COURSE IN EITHER JEEP OR POWER PLANT, IF THERE IS LESS OPERATION THE FUEL COSTS ARE DOWN, BUT THE FIXED COSTS ARE NOT. THE MORE A PLANT OR JEEP IS USED, THEN THE LESS PER KWH OR PER MILE COSTS.

JUST AS THE JEEP NEEDS RESERVES - POWER SYSTEMS ALSO NEED RESERVES TO HANDLE UNEXPECTED DEMANDS ON THE SYSTEM. ESPECIALLY COLD OR HOT WEATHER WILL AFFECT PEAK LOAD. IN 1979 OUR FORECAST LOAD IS 10,601 MW. THIS PEAK DEMAND IS EXPECTED TO GROW TO 20,947 MW BY 1993. THIS IS A GROWTH OF 97.6% OVER THE PERIOD.

WHAT WILL BE REQUIRED TO MEET THIS INCREASED DEMAND? MORE POWER PLANTS ARE NECESSARY IF WE ARE TO KEEP ELECTRICAL PRODUCTION AT A LEVEL TO PREVENT SHORTAGES.

4 IN DECEMBER OF 1978, THE N. C. UTILITIES COMMISSION RELEASED A DOCUMENT ENTITLED "FUTURE ELECTRICITY NEEDS FOR NORTH CAROLINA: LOAD FORECAST AND CAPACITY PLAN." SEVERAL FINDINGS OF FACT EMERGED FROM THIS DOCUMENT.

1. GENERATING RESERVES FOR THE N. C. COMPANIES (DUKE, CP&L, & VEPCO) SHOULD BE 20%. THIS IS THAT EXTRA POWER NEEDED TO CLIMB THOSE UNUSUALLY HIGH HILLS.
2. THE MOST ECONOMICAL MIX CALLS FOR $\frac{1}{3}$ BASE LOAD PLANTS. THESE $\frac{1}{3}$ CYCLING, AND $\frac{1}{6}$ PEAKING.

ARE THE ONES WHICH ARE DESIGNED TO OPERATE 24 HOURS/DAY - 365 DAYS/YEAR.

3. THE MOST ECONOMICAL METHOD OF GENERATION IS A COMBINATION OF HYDROELECTRIC, COAL AND NUCLEAR FUELED STEAM. ALTERNATIVES- I.E. SOLAR, WIND SHOULD BE CONTINUOUSLY EXAMINED AS ADDITIONAL SOURCES. THE PUBLIC STAFF AND THE UTILITIES PRESENTED DOCUMENTATION SHOWING THAT OVER THE LIVES OF ALL PLANTS BUILT OR EXPECTED TO BE BUILT FOR SERVICE BEFORE 1992 THAT NUCLEAR WOULD BE MOST ECONOMICAL BY .6¢/KWH.

FIGURES GENERATED BY THE PUBLIC STAFF AND STUDIES BY THE COMPANIES INDICATE AN ECONOMIC PLUS FOR THE NUCLEAR STEAM CYCLE. THIS ADVANTAGE IS THERE, EVEN IF NUCLEAR FUEL COSTS INCREASE 100% AND CONSTRUCTION COSTS BY 25%.

- 5 IT HAS BEEN CONTENDED THAT LARGE NUCLEAR UNITS ARE MORE EXPENSIVE TO BUILD AND OPERATE THAN SMALL COAL UNITS. IT HAS ALSO BEEN CONTENDED THAT THERE WOULD BE LESS FINANCIAL IMPACT AS WELL AS LESS ENVIRONMENTAL IMPACT IF GENERATING UNITS WERE SMALLER AND DECENTRALIZED.
- 6 DATA DEVELOPED BY THE PUBLIC STAFF AND PRESENTED TO THE COMMISSION SHOW THAT IF UNITS ARE EQUATED IN THE SAME TIME FRAME AND WITH COMPARABLE ENVIRONMENTAL TREATMENT - SMALL UNITS COST MORE TO BUILD PER KWH OF CAPACITY. NOT ONLY CAPITAL COSTS ARE MORE, PERSONNEL REQUIREMENTS ARE APPROXIMATELY THE SAME FOR ROUND THE CLOCK OPERATION REGARDLESS OF SIZE. HIGHER COSTS WOULD ALSO OCCUR IN TRANSMISSION LINES AND NECESSITATE MORE RIGHT-OF-WAY LAND. WATER USE IS ALSO LESS EFFICIENT AND LESS ENVIRONMENTALLY ACCEPTABLE.

WITH THESE DATA, N. C. COMPANIES ARE PLANNING LARGE CENTRAL STATIONS TO PROVIDE THIS ELECTRICAL ENERGY.

9 I REMEMBER WHAT AN 8TH GRADE TEACHER OF MINE ONCE SAID AND IT IS
EQUALLY GERMAINE TO OUR DISCUSSION TODAY -

" CHANGE IS AS INEVITABLE AS DEATH -IF WE CANNOT ACCEPT CHANGE,
THEN WE DO NOT TRULY UNDERSTAND LIVING."

FORECASTS MADE FOR THE FUTURE ARE NOT UNCHANGEABLE: TO PLAN FOR THE
FUTURE IS TO ACCEPT CHANGE IN THOSE PLANS AS THE FUTURE BECOMES
THE PRESENT.

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